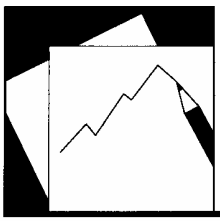
WP/04/76



IMF Working Paper

Can China Grow Faster? A Diagnosis of the Fragmentation of Its Domestic Capital Market

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INTERNATIONAL MONETARY FUND

 WP/04/76

IMF Working Paper

Research Department

Can China Grow Faster? A Diagnosis of the Fragmentation of Its Domestic Capital Market

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Authorized for distribution by Raghuram Rajan

May 2004

Abstract

This paper examines possible segmentation of the internal capital market in China. We employ two standard tools from the international finance literature to analyze financial integration across Chinese provinces. Both tests confirm a similar (and somewhat surprising) picture: capital mobility within China is low! Furthermore, the degree of internal financial integration appears to have decreased, rather than increased, in the 1990s relative to the preceding period. Finally, we document that the government tends to reallocate capital from more productive regions to less productive ones. In this sense, a smaller role of the government in the financial sector might increase the rate of economic growth.

JEL Classification Numbers: O1

Keywords: Chinese economy; internal capital market; financial integration; Feldstein-Horioka, risk sharing

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[1] The authors would like to thank Ray Brooks, Nick Lardy, Huayong Ge, Albert Keidel, Eswar Prasad, Gang Yi, and participants at an IMF seminar, the inaugural meeting of the National Bureau of Economic Research (NBER) Working Group on the Chinese Economy in October, 2003, and a conference at Hong Kong University for very useful comments. The views expressed are the authors' own, and do not represent those of the World Bank, the IMF, or their respective policies.

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I. INTRODUCTION

Understanding the patterns of Chinese development can assist our understanding of economic development in developing countries generally. This paper looks at the features of capital markets in China. The problem of non performing loans in its banking sector has received much attention, with some authors arguing it is a time bomb for its financial system and economy that will explode if not treated in a systematic and timely manner (e.g., Lardy, 2001). However, another potential drawback of the Chinese financial system is the possibility of regional segmentation of its capital market which may have prevented capital and savings from being used in the most efficient areas. There are a series of inter-related questions that need to be addressed. How integrated is the internal capital market in China? How common is it for savings generated in one part of the country to be channeled to another part? How has capital mobility evolved over time? Does capital flow from less to more productive regions? These questions are of great importance. In contrast to the question on non performing loans, capital market segmentation within China has not received any formal investigation.[2]

This paper aims to fill this void. It studies the degree of internal capital market segmentation in China by applying two standard approaches used in the international finance literature. The first approach uses the Feldstein and Horioka (1980) (FH) test, which examines the correlation between investment and saving. The idea behind the FH test is that under the null hypothesis of a perfectly integrated capital market, investment in one region should not be constrained by the local available savings in that region. Hence, the correlation between local savings and local investment should not be high. The FH test has been modified over time. We implement both the original version of the FH test and the modified versions proposed in the literature.

The second approach uses consumption-based tests from the risk-sharing literature to evaluate the degree of financial integration (Obstfeld, 1994). The idea is that under the hypothesis of perfect capital mobility and asset market completeness, households should be able to smooth consumption over time and across space with the aid of financial transactions. As a result, consumption volatility should be smaller than income volatility and consumption growth rates should be more closely correlated across regions than income growth rates.

A brief review of other related literature is in order here. As mentioned previously, there are very few papers that examine the issue of intranational capital market segmentation in China. However, there is a literature that looks into the economic federalism in China, a second one that looks into the segmentation of the goods market in China, and a third one that looks into restrictions on labor migration. According to Qian and Xu (1993), China can be described as a case of de facto federalism, involving a decentralized economic system in which each region can be considered an autonomous economic entity. Qian and Xu argued that this decentralized system has contributed to the vitality of the Chinese economy. Does

[2] Although the question of financial integration has not been studied, the question of the efficiency of capital allocation in China has been analyzed by Park and Seht (2000); Cull, Shen, and Xu, (2002); and Cull and Xu (2000).

this de facto federalism lead to a highly competitive, nationally integrated goods market or a collection of highly protected and locally fragmented markets? Views on this matter differ. Young (2001) reported evidence that there is an insufficient amount of regional specialization in goods production; the production structure appears to be too similar across different parts of China relative to what is needed for development of an integrated country. On the other hand, Huang and Wei (2001) examined the speed of convergence toward the law of one price for identical products in different cities in China during the 1990s and found that the speed of convergence is, in fact, comparable to what Parsley and Wei (1996) or O'Connell and Wei (2002) found for the United States. In other words, judging from the speed of convergence to the law of one price, the degree of goods market integration in China in the 1990s is probably comparable to that in the United States which, of course, has a highly integrated domestic goods market.[3]

By studying possible segmentation of the internal capital market in China, the current paper, complements the literature on the segmentation of the goods market inside China. It also provides an assessment of how efficient the capital market is in allocating capital flows to more productive regions: if capital is mobile and driven by profit incentives, it should flow spontaneously to the most productive areas. We document that the government (as opposed to the private sector) tends to reallocate capital from more productive regions to less productive ones. In this sense, a smaller role of the government in the financial sector might increase the growth rate of the economy.

The rest of the paper is organized in the following way. Section II characterizes the channels for capital mobility within China. Section III conducts a series of tests on whether local investments are constrained by local savings. Section IV studies the degree of consumption risk sharing across the country. Section V examines how investment in China is allocated across different regions. Section VI offers concluding thoughts. The appendix describes the data.

II. INSTITUTIONAL BACKGROUND ON CAPITAL MOBILITY IN CHINA

There are three main channels to transfer capital within a country from one region to another. The first is cross-regional domestic investment by firms and government. The second is cross-regional lending by the banking system and the third is cross-regional capital financing from the bond and stock market.

[3] Using data from provincial level input-output tables, Naughton (2000) documented an increase in the inter-provincial shipment of goods in the 1990s relative to their GDP; suggesting that goods market integration is likely have increased. On the other hand, using similar data but embedding it in a gravity-model specification, Poncet (2001) showed that the level of intra-provincial trade in China appears too high relative to the model prediction; suggesting the presence of barriers to goods trade at the province-level.

A. Cross-Regional Investment by Firms and Government

How easy is it to for a firm in one region in China to invest in another region? At a first glance, nationwide regulations and tax system are fairly neutral for a firm choosing to invest elsewhere. However, there are important regional barriers and special fiscal incentives that distort the national capital market. Local governments are reluctant to see capital flowing out their jurisdiction because it may entail a revenue loss. Furthermore, local governments may also fear loosing good performing enterprises with associated job losses.[4] As a result, most mergers and acquisitions tend to be localized (e.g., within a province, a county, or a city) rather than across regions because of resistance at various levels of the bureaucracy. On top of these factors, special tax incentives in the numerous special investment zones create significant distortions in the relative attractiveness of investing in one or another part of the country.[5] To sum up, market-driven capital mobility through cross-regional investment by enterprise is likely to be limited.

By contrast, policy-driven capital mobility initiated by central government investment policy has been active for redistributing resources from one region to another although its importance has declined over time: The share of investment financed by the stare was as high as 28 percent in 1981 and of 7 percent in 2001, and the share of investment under central responsibility was of 45 in 1980 and of 31 percent in 2001.[6]

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[4] For a description of local government interference in enterprise mergers, see the excellent institutional review of China's capital market developments in China since 1949 in Yi, 2003.

[5] As part of China's open door policy, special areas with special tax incentives (mainly under the form of lower enterprise tax) were created. Tax exemptions were aimed primarily at attracting foreign investment. Domestic enterprises often benefit from these fiscal incentives, either automatically or on a discretionary basis.

[6] More recently, the government has initiated a new policy focusing on the development of the western region as an attempt to re-equilibrate China's regional development which previously had been overwhelmingly favorable to the coastal region. This new policy launched in 2000 has two main components: the development of infrastructure with the central government investing in the region and the extension of fiscal incentives to the western provinces.

B. Cross-Regional Lending by the Banking Sector[7]

Within the banking system, there are three main channels for transferring financial resources from one region to another: fund reallocation among regional branches of national banks (within-bank transfer); the interbank market (between-bank transfer);[8] and central bank lending to the regions.

Up to the early 1990s, the government had been using a system of credit ceilings for controlling the money supply. Under this system, within and between-bank transfers were limited. Quotas were imposed on bank lending for each bank and in turn broken down by region. Interbank lending and borrowing have however contributed to capital mobility to a certain extent.[9]

Within and between-bank transfers are likely to have increased as bank were given more autonomy in the 1990s. First, banks were gradually allowed to allocate their national credit ceilings among regional branches.[10] Second, in 1995, banks became responsible for

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[7] China's banking system is composed of the People's Bank of China—China's central bank; four state-owned commercial banks, established in the early 1980s; three policy banks set up in 1994, ten national joint-stock commercial banks; around 90 regional commercial banks, and about 3,000 urban and 42,000 rural credit cooperatives. Foreign banks have branches or representative offices, but their activities are still limited. The four state-owned commercial banks—dominate the market.[7] As of late 2001, they accounted for 63.1 percent of loans outstanding and 61.5 percent of deposits. They also dominate in terms of branches and employees: nearly 2 million people are employed in about 103,000 branches across China.

[8] Park and Sehrt, 2000.

[9] Local interbank markets were permitted between 1986 and 1993. Bank branches were able to lend funds to branches in other provinces. However, it also became a mean for balancing the surplus and shortage of medium and long term funds. For instance, coastal open areas borrowed from inland areas large sums of money for long term financing purpose to make up for local fund shortage (Xie Duo, 2002). It also became a mean for state banks to circumvent credit quota and lend to non-banking financial institutions for speculative purposes (investment in securities and real estate industry), and thereby fueling inflation. Hence, as part of the retrenchment policy implemented in 1993, interbank trading was suspended, with the exception of trading center run by PBC branches in 35 cities.

[10] Starting in 1994, credit ceilings applied only to state banks and more importantly, these ceilings were no longer administratively determined, but based on a maximum ratio between loans and deposits that applied only to total national lending by individual state banks (all branches if a national bank are counted together). In January 1998, the annual credit quota system was officially abolished The central bank now relies mostly on tools such as manipulation of interest rates, required bank reserves and asset-liability ratios, credit assessments, discount rates and, increasingly, open-market operations to control the money supply.

(continued…)

their losses while four development banks were created to take over the “policy loans”—lending made typically to state-owned enterprises not on the basis of risk-return tradeoff alone—from each of the corresponding state banks.[11] The objective was to relieve state-owned commercial banks of their policy activities and to induce their management to be fully profit driven. Within bank-transfer is likely to have increased over the 1990s in accordance with greater autonomy granted to the banking system. However, the ceilings imposed on interest rates for both deposits and loans limit the bank incentives for maximizing profit. Third, in January 1996, a national unified interbank market was created and in June, interbank interest rates were liberalized. This should facilitate capital mobility. At the same time, cross-regional capital movements, particularly those initiated by local branches, which were tolerated previously, have been prohibited. Hence the net effect of these policies on capital mobility is uncertain, and needs to be examined empirically.

Central bank lending has been an important policy instrument for allocating resources over the credit plan period. The central bank engaged in a massive redistribution of bank deposits to support the credit plan and policy lending objectives.[12] The vast majority of PBC relending was channeled through PBC local branches. These local branches were heavily influenced by the local authorities and therefore keen to increase the central bank relending inside the jurisdiction. As a result, credit targets were often exceeded at the national level and had to be financed by central bank extra-lending. To keep hard money creation under control, central bank lending was recentralized through first the limitation of PBC lending to bank headquarter only and second the replacement of provincial by regional branches of the central bank.[13] As a consequence, the role of central bank lending in capital reallocation is likely to have been limited following the reforms.

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[11] New commercial bank law enacted in 1995.

[12] The People’s Bank China became in 1984 the central bank of China responsible for designing and conducting monetary policy. Lardy (1998) defines "excess lending" as measured by the amount of loans extended above and beyond the amount that would have been extended if the loan to deposit ratio was equal to the national average. According to this measure, excess lending was as much as 8 percent of provincial gross domestic product in Heilongjiang in 1993 and the "under lending" in Guangdong averaged 7.5 percent of provincial GDP in a five year period.

[13] In May 1994, local PBC branches were prohibited from relending to state banks in their locality. The PBC instead directed refinancing to the national headquarter of state banks which redistributed them to local branches based on approved plans. Since July 1993, only the central bank's headquarters has been permitted to lend to the head offices of banks. Furthermore, at the end of 1998, the PBC was restructured to reduce further the local influence on lending. Its 31 provincial branches were cut back to nine regional ones, which report directly to PBC headquarters.

C. Cross-Regional Issuance of Capital from the Stock and Bond Markets

The third channel of capital mobility is the equity and fixed income markets. Although banks dominate the financial sector, there are recent signs of a shift towards more market-based financial transactions. Table 1 reports the changes in financial assets and liabilities of each institutional sector in China and between those sectors and the rest of the world in 2000.[14] On average, 67 percent of total financial transactions are conducted through the banking system (loans and deposits). By contrast, only 5 percent of financial flows go through the market (bond and stock exchanges). However, even if loans still represent more than half of the non-financial corporations financing, indirect finance—mainly by share issuance—is becoming a significant source of financing, representing 14 percent of total financing sources in 2000. In 1997, this share was marginal, of 1 percent of total financing sources. Similarly, between 1997 and 2000, there is a shift of household assets from saving deposits to both foreign exchange deposits and securities. Households invest in 2000, 20 percent of their financial assets in the form of securities (14 percent in stock, 6 percent in bonds), compared to 14 percent in 3 years earlier. The government also relies more on bond issuance (84 percent of total sourcing of finance in 2000 compared to 78.9 percent in 1997). Finally, financial institutions have also increased their portfolios share of securities. These shifts in financial portfolios suggest a tendency of capital market to evolve toward a more market-based system in which direct financing through stocks and bonds playing an incrementally more important role. In principle they are likely to facilitate interregional capital mobility over time, although not sufficiently significant at this moment.

To sum up, market-driven capital mobility was limited over the 1980s, but is likely to have gained in importance over the 1990s. However, the government continues to play an important role in allocating financial resources. Its control of cross-regional capital flows were strengthened in some dimensions in the 1990s.

III. Are Local Investments Constrained by Local Savings ?

A. Basic Idea

For the purpose of discussion, we start with two hypothetical extreme cases. With zero capital mobility across regions, local savings can only be invested locally, and all local investment has to be financed by local savings. In this case, local investments and local savings should be perfectly correlated. In the other extreme, with perfect capital mobility, savings from any particular locale can go anywhere in search of the best return-risk trade-off. In other words, local savings respond to global opportunities for investment, while local

[14] Source: The People 's Bank of China Quarterly Statistical Bulletin, 2002:4. pp. 78–79. The flow of funds accounts encompass all financial transactions among domestic sectors and between domestic sectors and the rest of the world. The terms “uses” and “sources” reflect the changes in financial assets and financial liabilities of each sector. They are available since 1997 onwards.

investments are financed by a national or international pool of capital. There need not be any exact relationship between local saving and local investment. While this does not necessarily imply a correlation of zero, the correlation should be substantially below one. This is the fundamental idea of Feldstein and Horioka (1980) who proposed to use the saving-investment correlation as a measure of (lack of) capital market integration.

The Feldstein-Horioka (FH) test was initially proposed as a test of world capital market integration, i.e. as a measure of the degree of capital mobility across countries. In that context, the literature suggests that it does not give conclusive evidence on capital mobility because a low saving-investment correlation can be consistent with various alternatives other than a low degree of capital market integration across countries. These alternatives include the presence of a risk premium associated with currency devaluation, and governments' effort to target the level of current account balance by manipulating the exchange rate. However, within a country, the FH test turns out to be a reasonable indicator of the degree of capital market integration across different regions. The main reason is that the alternative interpretations mentioned above are not operative within a country. If different parts of a country share a common currency, there is no currency devaluation to speak of. Regional governments are also less likely to have a current account target at the regional level.[15]

As a reference, Table 2 summarizes the results from five prominent papers in the literature that have examined the intra-national evidence of investment-saving correlations in developed countries. The countries that have been studied are Canada, Germany, Japan, United States and United Kingdom, all of which are known to have an integrated capital market internally. Each of the papers has found non-significant or negative saving-investment correlations across the regions. This provides a justification for using the FH test to examine capital market integration within China.

In this section, we first present simple (unconditional) correlations between saving and investment across Chinese provinces and compare them with the corresponding figures from countries with known integrated internal market. We then compute a series of conditional correlations, following a procedure used by Iwamoto and van Wincoop (2000), that control for a number of factors other than capital market integration that can affect the saving-investment correlation. Because China's capital market is largely dominated by the banking system, we also perform the same tests using banking deposit and loan data: to which extent the local banking system has to rely on local deposits to extent new loans.

B. Unconditional FH Test

We use a dataset on all Chinese provinces for which data are available to conduct our test. This means 28 provinces (or province-level autonomous regions or super-cities) on the mainland during the reform period (1978–2001), and 24 provinces during the pre-reform

[15] Note that local protection in the goods market and current account target are not the same thing.

period (1952–1977).[16] The database comes from a vender called A11 China Marketing Research, and consists of provincial GDP desegregated into household and government consumption, gross capital formation, change in inventory and net exports. Provincial saving is defined as regional GDP minus private and government consumption. Provincial investment is defined as the change in gross capital stock of both the private and public sectors. Both saving and investment are expressed as a ratio of provincial GDP.[17]

Table 3 reports the correlations of investment and saving rates in the Chinese provinces averaged over the pre-reform period (1952–1977), the reform period (1978–2001) and two sub-periods within the reform period (1978–1989 and 1990–2001).[18] For comparison purposes, Table 3 also reports the corresponding figures for the national economies of OECD countries.[19]

The averaged correlation between local investments and savings are 0.53 during the pre-reform period (1952–1977) and 0.53 during the reform period (1978–2001). By comparison, correlations between investment and saving rates *within* member countries of the OECD such as Japan or the United States where a high degree of capital mobility can be assumed are either insignificantly different from zero or even negative (Table 2). On the opposite extreme, correlations between investment and saving rates across OECD member countries are 0.71 between 1960 and 1977 and 0.45 between 1978 and 2001, as reported at the bottom of Table 3. Hence, the intra-national correlation levels found in China are much closer to a between-country level than to a within-country level relative to the evidence based on OECD countries. These comparisons suggest the presence of barriers to capital mobility across the Chinese regions.

We next examine the evolution of the saving-investment correlation over time. The results are reported in columns 3 and 6 of Table 3. These correlations do not vary much before and over the reform period, as shown by the insignificance of the variation. By contrast, the correlation sharply increases from 0.30 in the 1980s to 0.60 in the 1990s (column 6, Table 3). This result is somewhat surprising if we believe that the capital market should have become incrementally more integrated over time along with the progresses in market reforms and opening-up of the economy.

As already mentioned, simple correlations based on raw data only provide a preliminary measure of financial integration, as factors other than market integration can

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[16] The provinces of Jianxi, Guangdong and Hainan, Sichuan and Chongqing and Ningxia have been excluded for the pre-reform period because of lack of data.

[17] We have tested for the order of integration of the series using panel unit-root tests (Im, Pesaran, and Shin, 1997). Both investment and saving rates are stationary.

[18] We also investigate the presence of structural breaks in the series over the 1990s.

[19] The data of investment and saving for OECD member countries come from the United Nations National Accounts Statistics and are available from 1960 onwards.

affect the correlation between investment and saving rates. In the following sub-section, we apply a conditional FH test to the Chinese data that control for these factors.

C. Conditional FH Test

The conditional FH test that we use follows the strategy proposed by Iwamoto and van Wincoop (2000). Their idea is that if financial markets are integrated, investment depends on factors that determine the global and national supply of funds, factors that determine the productivity of capital, and a set of region-specific factors. Saving in the same country also depends on global and region-specific factors. The global and national factors can be condensed and labeled as g. Those region-specific factors which affect investment and saving can be organized as a set of uncorrelated vectors v, w, and z, whereby v and w affect investment, and v and z affect saving. In other words, v is a vector of region-specific factors that affect both investment and saving. w (z) is a vector of factors that affect investment (saving) independently. Investment and saving can be expressed respectively as the following functions: I = I(g,v,w) and S = S(g,v,z). By construction, if researchers do not control for the effects of g and v, then local savings and local investments would be correlated even in the case of a fully integrated financial market.

Iwamoto and van Wincoop implement a method based on this framework to the Japanese prefectures and find that the correlation between local investment and local savings is low once the global/national, and regional factors are controlled for. As a result, The authors conclude that the degree of financial integration across the Japanese regions is high. We apply their method to the Chinese provinces. First, we control for national shocks by subtracting national saving and investment rates from the province's saving and investment rates:

$$S_{it}^* = S_{it} - S_{-it} \quad (1a)$$

$$I_{it}^* = I_{it} - I_{-it} \quad (1b)$$

where S_{it} and I_{it} are, respectively, the saving and investment rates in province i, S_{-it} is the national saving rate outside province i, and I_{-it} is the national investment rate outside province i[20].

Second, we control for region-specific shocks for by regressing saving and investment rates for each province separately on region-specific determinants that can affect saving and investment co-movements (equation 2a and 2b):

[20] Some of the provinces constitute a non-trivial fraction of national saving and investment. We therefore use rest of the country instead of national aggregates in order to avoid distorting the correlations upwards.

$$S_{it}^* = \alpha_i + \alpha_y y_{it} + \alpha_F F_{it} + e^S_{it} \quad (2a)$$

$$I_{it}^* = \beta_i + \beta_y y_{it} + \beta_F F_{it} + e^I_{it} \quad (2b)$$

where y measures the stage of local business cycles and F measures regional fiscal policies. The provincial series of business cycles, y, are generated by applying the Hodrick and Prescott (HP) filter to the local GDP series.[21] The fiscal variable, F, is the ratio of local government consumption to local GDP. The residuals e^S_{it} and e^I_{it} from equations (2a) and (2b) respectively are in turn used to compute the new correlation between saving and investment.

Table 4a reports the results. The average correlation between investment and saving drops from 0.53 to 0.19 after controlling for national shocks over the pre-reform period and from 0.53 to 0.34 over the reform period (row 2, Table 4a). When region-specific factors are also controlled, the correlation decreases further to 0.14 and 0.21 over the pre-reform and reform periods, respectively (row 3, Table 4a).

However, the increase in the correlation from the 1980s to the 1990s, reported in the unconditional test in Table 3, continues to be true even after even after common national shocks and region-specific (business cycles and fiscal) shocks to local saving and investment are controlled for. As reported in Row 3 of Table 4a, the local investment-saving correlation is 0.04 in the 1980s (Column 4, Row 3), but rose to 0.43 in the 1990s (Column 5, Row 3). So the puzzle remains: there appears to be a deterioration in capital market segmentation.

To control for possible simultaneity bias of the regressors, we introduce the one-year lagged values of the region-specific variables in equations 2a and 2b. As reported in row 4 of Table 4a, the use of lagged instead of contemporary values leads to very similar results. Finally, for comparison purposes, columns 7 and 8 report the results found by Iwamoto and van Wincoop respectively for the Japanese prefectures and OECD countries. For the Japanese prefectures, the correlation becomes statistically insignificant once national and regional factors are held constant (Column 7, Row 3). By contrast, the correlation across OECD economies conditional on global and national factors is 0.28 (Column 8, Row 3).

Finally, we investigate the marginal impact of local savings on local investment, i.e., to which extent one extra unit of local saving contributes to finance local investment. To do so, we regress provincial investment rates on local savings rates and report the estimate of the saving rate coefficient in Table 4b. The results are similar to the previous ones using investment-saving correlations. The coefficient of local saving is positive and statistically

[21] We use HP(100) filtered log(province GDP) minus HP(100) filtered log(national GDP).

significant even when national and regional factors are controlled for. There is an increase in the saving coefficient over the 1990s. Therefore, there is no evidence of an improvement in the degree of capital market integration.

D. Capital Mobility Within the Banking Sector

Because China's capital market is dominated by banks, performing the FH test using provincial bank deposits and loans may be particularly informative. Within and between bank transfers were limited under the credit plan period and gained progressively in importance over the 1990s along with the banking reforms aimed at granting banks more autonomy and financial responsibility. Therefore, testing for the deposit and loans correlation level of significance may provide another piece of evidence of the degree of capital mobility within China.

Table 5 reports the results of applying the same methodology as above to deposits and loans data in the Chinese provinces as well as in the OECD member countries for the purpose of comparison. The unconditional correlation is of 0.66 over the 1980s and 0.50 over the 1990s, a level similar to the correlations between OECD member countries, of 0.63 and 0.62 respectively over the 1980s and the 1990s. When we control for the national trend, the average correlation within China drops from 0.66 to 0.30 over the 1980s, and increases slightly over the 1990s. This suggests that the importance of the national component over the 1980s has decreased over the 1990s. Indeed, the reforms implemented over the 1990s granting the banks more autonomy have at the same time decreased the importance of central planning. For comparison, the global component for OECD member countries has little impact on the correlation.

Finally, when national and regional factors are both controlled for, the correlation between deposits and loans increases over time, from 0.44 during 1878–89 to 0.58 during 1990–2001 (Row 3, Columns 1 and 2 of Table 5). The increment is statistically significant (Column 3, Row 3 of Table 5), suggesting a possible decrease in capital mobility within the banking sector over the 1990s.

Overall, the finding of a positive and significant correlation after controlling for the national factors and region-specific shocks suggests that there are still significant barriers to intra-national capital mobility in China. Hence, the patterns of capital flows within China remain closer to that of *international* capital movements as opposed to *intranational* capital mobility observed within individual countries with no internal barriers (such as Japan). Moreover, we find a significant increase in investment-saving correlation corresponding to a decrease in capital mobility in the 1990s. The latter result is consistent with the findings of a deterioration in capital allocation over the 1990s (see Cull and Xu, 2000, Park and Sehrt 2001). It is also consistent with the result of an increase in the dispersion of the marginal rate of return to capital found by Tan and Zhang (2003).

IV. Is There Effective Risk Sharing in Consumption?

In this section, we turn to examining another aspect of internal financial integration that focuses on the consumption side (as opposed to the investment side discussed in the last section), namely, the extent to which the internal capital market in China allows sufficient risk-sharing in consumption across different regions.

A. Basic Idea

According to the literature on international risk-sharing (see Obstfeld, 1994 for reference), in a fully integrated world, individuals can, by pooling their risk, insure against uncertainty in their incomes. Under the assumption of a complete asset market and perfect capital mobility, household changes in consumption should move one for one with aggregate changes in consumption absent of idiosyncratic fluctuations of preferences or measurement errors. Furthermore, differences in consumption changes across households should not be correlated with changes in household resources.

Based on this idea, one can construct another measure of capital market integration.[22] Given that assumptions of perfect capital mobility and market completeness are at odds with reality, one would not expect to find a perfect coherence in the evolution of per capita consumption across countries. A more reasonable hypothesis would be to observe, in the presence of increasing international capital mobility and financial sophistication, an increasing coherence of consumption fluctuations and a decreasing volatility of consumption.[23] According to the empirical evidence found in the literature, consumption is more correlated *within* individual member countries of the OECD, where we know that the level of financial integration is high, than *between* them.[24] The general conclusion of the intra-national literature is that intra-national risk-sharing is much stronger than international risk-sharing.

This section is organized as follows: we first present an unconditional test of risk-sharing in order to characterize consumption smoothing in the Chinese provinces. We apply

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[22] For a survey of the literature on risk-sharing see Crucini and Hess (2000).

[23] For instance, Obstfeld (1994) notes that among the G-7 countries over the period 1951 to 1988 there has been a tendency for domestic consumption to become more closely correlated with the world consumption

[24] The intra-national risk-sharing literature has used regional data within Canada (Crucini (1999) and Bayoumi and McDonald (1995)), Japan (van Wincoop (1995)) and the United States (Atkeson and Bayoumi (1993), Crucini (1999), Hess and Shin (1997), Asdrubali, Sorensen, and Yosha (1996).

thereafter the framework proposed by Obstfeld (1994) that allows testing for risk-sharing even with an incomplete asset market.[25]

B. Unconditional Test of Risk Sharing

Table 6 shows the correlations of provincial per capita consumption growth with the rest of the country's per capita consumption growth rate and the correlation of per capita GDP growth with the rest of the country's per capita GDP growth rate.[26] All the data are expressed in real terms using the 1978 prices and in log-difference. As in the previous section, correlations across the Chinese provinces are calculated over the pre-reform period (1952–1977), the reform period (1978–2001) and two sub-periods within the reform era (1978–1989 and 1990–2001). For comparison purpose, the corresponding figures for OECD member countries are also computed and reported.

Consumption correlations across the Chinese provinces average respectively 0.62 and 0.54 over the pre-reform and reform periods. By comparison, the corresponding figures for OECD member countries stand below at 0.35 in both periods (Table 6, row 4). Intra-national correlations of consumption found in the empirical literature on risk-sharing are reported in Table 7. Local per capita consumption growth rates are more correlated within China than within individual OECD member country economies such as USA (correlation of 0.31 or 0.40, as reported in Table 7) or Japan (correlation of 0.46, also reported in Table 7). Thus and somewhat surprisingly, per capita consumption growth rates are more correlated within China than in any other international or intra-national sample of OECD member countries where we know that financial integration is high. It would be however misleading to conclude that there is a higher degree of risk-sharing within China than within the United States just based on this evidence alone. Indeed, a high level of consumption correlation can reflect a high correlation of local output, coupled with a close association between consumption and output growth rates. As reported in the second row of Table 6, local output growth rates are highly correlated in China. The correlation coefficients equal to 0.80 over the pre-reform period and 0.65 over the reform period. Furthermore these estimates are higher than that of OECD member countries (row 5, Table 6) or that of regions within Japan or United States (column 3, Table 7).

We thus need to express consumption growth rate correlation relative to the corresponding GDP co-movements. We do so by dividing the correlation of local

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[25] Finally, consumption-based tests that do not assume asset market completeness provide a more realistic framework for assessing the degree of financial integration on the basis of risk-sharing theoretical predictions.

26 Consumption and GDP series come from the 2001 A11 China Marketing Research database (see appendix for a description of the data). Some of the provinces constitute a non-trivial fraction of national output. We therefore use rest of the country instead of national aggregates (e.g. we exclude the province' contribution) in order to avoid distorting the sample correlations upwards.

consumption growth rates by the correlation of local output growth rates (rows 3 and 6 in Table 6). Because local consumption growth rates are less correlated across the provinces than GDP growth rates for the pre-reform period, the ratio is statistically significantly below unity while it is not over the reform period. By comparison, the corresponding ratio for OECD economies is not significantly different from one between 1960 and 1977 and between 1978 and 1999 (row 6, Table 6).

Columns 3 and 6 of Table 6 report the difference-in-mean test of the change in the correlations between the pre-reform and the reform periods and between the 1980s and the 1990s. Both consumption and output correlations decrease between the pre-reform and the reform periods, as revealed by the negative and significant sign of the variation (-0.080 and -0.148 respectively). Because the output correlation decreases to a larger extent, the relative consumption correlation increases (by 0.054, column 3), but this change is not statistically different from zero.

Furthermore, if one splits the reform period into two parts, 1980s and 1990s, a somewhat surprising pattern appears (Table 6, Columns 4 and 5). The consumption correlation declines markedly (from 0.70 to 0.21) while the output correlation increases (from 0.63 to 0.72, rows 1 and 2). Those two opposing movements lead to a sharp drop in the relative consumption correlation from 1.10 to 0.30 (Row 3, Columns 4 and 5 in Table 6). This decline is statistically significant (Row 3, Column 6). If one performs a similar computation for the OECD countries, one finds that there is also a moderate decline in the relative consumption correlation (Row 6, Columns 4 and 5). However, unlike in the Chinese case, this decline is not statistically different from zero. In other words, there is a decline in the extent of consumption risk sharing across Chinese regions over the last twenty years.

As an alternative measure of consumption risk sharing, one can also look at the average consumption volatility relative to average output volatility. A higher degree of consumption sharing across geographic units would imply a lower relative consumption volatility. Table 8 reports the average volatilities of per capita consumption and output growth rates across the Chinese provinces as well as across OECD countries for comparison. Consumption and output volatilities are reported in rows 1 and 2 respectively. Generally, there is a significant decline in the volatility of consumption and output in the reform period compared to the pre-reform era. The relative consumption volatilities with respect to output volatilities for China and for OECD countries are reported in Rows 3 and 6 in Table 8, respectively. The relative consumption volatility within China is in the same range as the corresponding measure across OECD countries both in the pre-reform and the reform period. If one breaks down the reform period into the two decades, one finds that the relative consumption volatility in China has increased, rather than decreased, from 1.23 in the 1980s to 1.39 in the 1990s (Row 3, Columns 4 and 5), though the increase is not statistically significant. This suggests that the risk sharing opportunities have not improved over the last ten years.

To summarize, both the evidence on relative consumption correlation (regional consumption correlation relative to that of regional output correlation) and the evidence on relative consumption volatility (average consumption volatility relative to output volatility) appear to suggest that the degree of risk sharing across the Chinese regions is not high and

has not improved from the 1980s to the 1990s. However, these measures are not conclusive *per se*. A low degree of capital mobility can come from a low degree of financial integration within China, but also from incompleteness of the asset market. In the next section, we employ a modified measure of regional risk sharing based on Obstfeld (1994), which explicitly accounts for factors other than capital mobility in affecting risk-sharing.

C. Conditional Test of Risk Sharing

Obstfeld (1994) develops a model of international consumption risk-sharing from which several alternative tests are derived. The model allows testing two extreme cases of perfect and no capital mobility under the complete market hypothesis as well as the case for the broad middle ground where asset markets are incomplete. In this section, we apply this empirical methodology to evaluate the extent of risk-sharing in China.

The methodology proposed by Obstfeld (1994) relaxes the assumption of a complete market and consists of estimating the following equation:

$$dln(C_{it}) = a + b\, dln(C_{-it}) + c\, dln(LRL_{it}) + u_i + e_{it} \qquad (3)$$

where C_{it} is per capita private consumption in real terms, C_{-it} is aggregate per capita private consumption outside province i, $u_{i.}$ is the provincial fixed effect and e_{it} is the error term[27]. The term LRL_{it} stands for "Local Resource Limit" expressed in per capita terms. It is defined as $LRL_{it} = GDP_{it} - I_{it} - G_{it}$ where I_{it} is the investment rate and G_{it} is government consumption. It corresponds to the maximum consumption level when intra-national and international markets are closed. If local investment is constrained by local saving, then consumption is constrained by the local resource limit and the hypothesis b=0 and c=1 should not be rejected. Alternatively, if financial integration is high, we would expect b to be closer to one and c closer to zero. Intuitively, equation (3) gives an indication of the extent to which consumption is more closely related to global or local factors respectively represented by aggregate consumption C_{-it} or Local Resource Limit $LRL_{it.}$[28]

Table 9 reports the estimates of equation 3 using the sample of Chinese provinces and the test statistics of the relevant hypotheses. The null hypothesis of perfect financial integration (H3: b=1 and c=0) is rejected for both the pre-reform and the reform periods. At the opposite extreme, the hypothesis of no financial integration is also systematically rejected (H4: b=0 & c=1). For comparison purpose, Table 10 reports the corresponding results within OECD countries. The coefficient estimate of aggregate consumption increases steadily over time from 0.35 (1960–1977 period, reported row 1, column 1 of Table 10) to 0.60 in the

[27] Year effects are not included as they would be correlated with the aggregate consumption variable.

[28] As emphasized by Obstfeld, this framework is closely related to the investment-saving test for capital mobility. In addition, we also introduced aggregate output growth as a regressor and obtained very similar results.

1980s (row 1, column 3) and to 0.90 in the 1990s (row 1, column 4) while the coefficient estimate of the Domestic Resource Limit (DRLit) decreases continuously, from 0.43 (1960–1977 period) to 0.081 in the 1990s. These two opposite movements suggest an increase in the degree of financial integration among OECD countries. This conclusion is supported by the non-rejection of the null hypothesis of high financial integration (H3) over the most recent period (1990–1999).

The results suggest that OECD countries have become more financially integrated, while the conclusion is mixed for the Chinese provinces which have reached only a middle range financial integration over transition period. More specifically, there was an increase of regional risk sharing from the pre-reform era to the reform era. However, the extent of risk sharing went the opposite direction from the 1980s to the 1990s. The coefficient on aggregate consumption declined from 0.88 during 1978–1989 to 0.67 during 1990–2001. At the same time, the effect of local resource constraint on consumption increased from 0.06 in the 1980s to 0.14 in the 1990s. Therefore, there was a noticeable decline in the degree of regional risk sharing.

D. Was There Any Improvement in Capital Mobility in the 1990s?

We have shown that so far there is no evidence of an improvement in capital mobility from the 1980s to the 1990s. Several reforms in the early and mid-1990s could have the effect of improving capital mobility. We are thus interested in checking whether capital mobility has increased within the 1990s. We do so by breaking the last period in the sample (1990–2001) into two sub-periods (1990–1995 and 1996–2001) and testing for any significant variation in the investment-saving correlation or consumption smoothing over time.

First we investigate whether local investment is less constrained by local savings in the late 1990s as opposed to the first half of the decade. The first two lines of Table 11 reports the results. The unconditional measure of investment-saving correlation exhibits a modest decline, suggesting a slight improvement in capital mobility. However, the conditional measure exhibits a slight increase, suggesting a deterioration. In any case, neither this decrease not the increase is statistically significant. Moreover, the level of the investment-saving correlation in the second half of the 1990s is still very high (0.58 and 0.42 respectively for the unconditional and unconditional measures) and in the same range as the estimates over the 1980s (see the estimates in Tables 3 and 4a). We find similar results using deposit and loans data (lines 3 and 4): no significant variation is found within the 1990s. Therefore, as far as the close correspondence between local investments and local savings (or between local deposits and local loans in the banking system) is concerned, there is no evidence of a dramatic improvement in capital mobility from the first half to the second half of the 1990s.

The picture is somewhat different (and less clear cut) when it comes to consumption risk sharing. There is actually a statistically significant improvement in risk-sharing in the late 1990s as shown by the increase in the ratio of consumption correlation to output correlation (line 5) from –0.027 during 1990–1995 to 0.289 during 1996–2001. However, the extent of consumption smoothing in the late 1990s is still much lower than in the 1980s,

when the corresponding correlation was 1.29 (Table 6). Furthermore, no significant variation in consumption volatilities relative to income volatility is detected (line 6 in Table 11).

Finally, Panel B of Table 11 reports the results of the conditional risk-sharing model a la Obstfeld (1994) over the two sub-periods. The hypothesis of a high level of risk-sharing cannot be rejected over the 1996–2001 period. However, since the point estimate on consumption (0.81) is comparable to that in the 1980s (see Table 9), this failure to reject comes mainly from an increase in the standard error of the estimate (i.e., lower power of the test).

Overall, capital mobility may have improved a little bit from the first half of the 1990s to the second half. This mainly result from a recovery of the lost ground in the early 1990s rather than any significant progress relative to the 1980s.

At this juncture, it is useful to point out that capital mobility and efficiency of capital allocation need not be the same thing. For example, if local savings used to be randomly reshuffled by the central government under a planned-economy framework, then a move from an inefficient planned economy model to a market economy model could give an appearance of a reduction in capital mobility even though the efficiency of capital allocation (in terms of allocating capital to most productive investment projects) could have increased at the same time. As another example, informational asymmetry between users of funds and savers could result in low capital mobility even without any other policy-driven barriers to capital mobility.

These examples illustrate the possibility that evidence of low capital mobility does not automatically suggest low efficiency of capital allocation. In the next section, we investigate more directly, to the extent capital does move around within China, whether it is generally allocated from less productive regions to more productive ones.

V. WHY DOESN'T CAPITAL FLOW TO MORE PRODUCTIVE REGIONS?

An efficient capital market is one in which capital goes to the most productive activities. In our sample, one would expect that net capital inflow into a region (relative to that region's economic size) is positively related to that region's marginal product of capital. Therefore, we estimate variations of the following specification:

$$(\text{Net capital inflows})_{it} = a + b\,(\text{Initial income})_{-it} + c\,(\text{Marginal Product of Capital})_{it} + u_i + e_{it} \qquad (4)$$

To do this, we need information on every region's marginal product of capital. To keep it tractable, we assume a common form of Cobb-Douglas production function with constant returns to scale applies to all provinces:

$$Y_{jt} = A_{jt}K_{jt}^{\alpha}L_{jt}^{1-\alpha} \qquad (5)$$

The productivity parameter, A_{jt}, is allowed to vary across provinces and over time, but the factor share, α , is assumed to be the same across provinces and constant. This allows us to express the marginal product of capital for any province as a constant proportion of the ratio of its output to its capital stock (or the average product of capital):

$$MPK_{jt} = \delta Y_{jt}/\delta K_{jt} = \alpha A K^{\alpha-1} L^{1-\alpha} = \alpha Y_{jt} / K_{jt} \quad (6)$$

We make use the provincial-level capital stock data between 1984 and 1998 estimated by Li (2003) and updated by us to 2001 to calculate marginal product of capital.[29]

In Column 1 of Table 12, we estimate how net capital inflow to a province responds to its marginal product of capital. The result indicates a lack of positive association between net capital inflows and capital productivity. This suggests that capital flows within China do not go to the most productive regions, on average. To the contrary, the coefficient on local GDP growth is negative and statistically significant, indicating a tendency for capital to go to regions where capital has lower productivity. Figure 1 illustrates this pattern visually by plotting provincial average capital inflows over the whole period (1984–2001) against capital productivity together with the regression line. Provinces with the lowest average capital productivity such as Ningxia, Qinghai, Xinjiang, Shaanxi are also the ones that have received on average the highest capital inflows. On the opposite, provinces such as Hebei, Sichuan Guangdong, Hunan or Fujian are associated with a high productivity but small capital inflows.

In Columns 2 to 6, we investigate the response patterns of various components of a region's investment to local marginal product of capital. In our data set, the financing sources can be broken down into several different categories:

(a) Allocation through government budget: the appropriation in the budget of the central and local governments earmarked for capital construction and projects;

(b) Bank loans: loans from banks and non-bank financial institutions to local enterprises and institutions;

(c) Foreign Direct Investment (FDI): investment made by foreign-owned firms including joint ventures;

(d) "Self-raised funds" by firms: Funds raised by firms from their higher responsible entities ("headquarters" or ministries) or sources other than government budget and bank loans such as through issuance of stocks and bonds.

(e) Others: all other investment not in the above categories.

[29] See statistical annex for a description of the method used to compute provincial capital stocks and productivity.

An interesting pattern emerges. First, investment by domestic firms based on self-raised funds do respond positively to capital marginal productivity. This suggests that when investment is motivated mostly by profit maximization, it tends to go where it is most productive. FDI and self-raised funds are the only two categories of investment that exhibit a positive relationship with marginal product of capital, although the coefficient on FDI is not statistically significant. Second, investment allocated through government budget and loans made by state-owned financial institutions are (the only) two categories that exhibit a clear negative relationship with marginal productivity of capital. From these results, we conclude that it is the allocation of investment by government that is primarily responsible for the peculiar pattern that net capital flows go to less productive regions.

Why would the government systematically allocate capital away from more productive regions and towards less productive ones? There are at least three theories one might think of: First, the government may value poverty reduction in its objective function and therefore channels capital to poor regions. If a low initial income coincides with low capital productivity, one could see a negative association between capital inflows and capital returns.

Second, state-owned enterprises (SOEs) may act as a bottomless pits in sucking government-channeled investment funds. Here, one might consider two variations of the theory. Version A stresses a political-economy interpretation. SOEs may be politically more powerful than private firms or other non-state-owned firms such as township-and-village enterprises. Consequently, they are able to obtain more investment funds from the government, particularly through government budget allocation, even if they are not productive. Version B is a concern for employment in SOEs. Precisely because SOEs are less productive on average and have trouble competing for funds in a well-functioning and integrated capital market, the government, out of concern for employees in the SOEs, may choose to channel the capital systematically to SOEs even if they are not productive. Of course, the two versions of the theory are not mutually exclusive. Either way, they could generate a positive association between capital inflows and the importance of SOEs in local economies.

Third, the government could direct capital flows in favor of a particular industrial structure. It is understood in the literature that the Chinese central planning before 1978 systematically discriminated against the agricultural and other primary sectors in favor of industries. Since the reform started in 1978, the government rhetoric has been to extend more assistance to peasants/fishermen in the country side. If the rhetoric is reflected in the actual policy, one would see a positive association between net capital inflow into a region and the importance of the primary sector in the local economy.

We undertake an examination of these theories and report the results in Table 12. In the first column, we look at the net capital inflows. Capital inflows respond positively to the share of state production in the province and negatively to the share of agriculture. In the subsequent columns of Table 13, we examine the connections between various components of local investment and the initial income, the share of SOEs in local industrial output, and the share of the primary sector in local output. A few results emerge. First, there is no negative and statistically significant effect of initial income on investment. In other words, if

the investment funds are systematically channeled to poorer regions, the effect is not large enough to be picked up by the data. Second, interestingly, the share of SOEs in local industrial production has a clear positive and statistically significant effect on the size of investment allocated by government budget and that financed by bank loans. So the importance of state-owned firms in the local economy is a significant factor in explaining investment patterns from these two sources. In contrast, the share of SOEs has a negative sign in the FDI equation, suggesting that the presence of SOEs may act as a barrier to FDI. Third, the share of the primary sector in local GDP is not significant in any regression. This suggests that capital allocation in China neither favors nor discriminates against the primary sector in general.

To conclude, the strongest determinant of capital allocation rule in China appears to be the prominence of SOEs in local economies. SOEs generally grow more slowly than private and other non-SOE sectors of the economy. Therefore, an investment allocation rule by the government that favors SOEs would allocate capital systematically away from more productive regions and towards less productive ones. In this sense, a smaller role of the government in the allocation of capital might increase the growth rate of the economy.

VI. CONCLUDING REMARKS

Segmentation of the internal capital market may be a serious drawback for the Chinese financial system (on top of the bad-loans problem in its banking sector). Since it prevents savings and capital from being used in the most productive areas. However, this issue has not received much research attention. This paper fills this void by analyzing internal financial integration across provinces over the pre-reform and reform periods from 1952 to 2001.

Our analysis is based on two standard approaches from the international finance literature, namely tests of local investment-saving correlation and of consumption smoothing. Our results suggest that capital is much less mobile within China than within countries known to have integrated international capital markets. Overall, the patterns of capital flows within China appear closer to the patterns of international capital movements than those seen in other intra-national studies. Perhaps most surprisingly, we find that the degree of capital mobility in China significantly decreased in the 1990s, relative to the 1980s. Finally, we document that the government (as opposed to the private sector) tends to systematically reallocate capital from more productive regions to less productive ones.

I. Statistical Appendix

The provincial series for consumption, investment and GDP consist of provincial GDP desegregated into household and government consumption, gross capital formation, change in inventory and net exports (provincial accounting). The statistical sources are:

- A11 China Marketing Research, 2001, 1949–1999 China Statistical Data Compilation
- State Statistical Bureau, 1996, China Regional Economy, a Profile of 17 years of Reform and Opening-up, China Statistical Bureau, Beijing
- State Statistical Bureau, 2000 and 2001, *China Statistical Yearbook*, China Statistical Bureau, Beijing.

The dataset includes 28 provinces (or province-level autonomous regions or super-cities) on the mainland during the reform period (1978–2001), and 24 provinces during the pre-reform period (1952–1977).

List of provinces in the sample (1978–2001) : Beijing, Tianjin, Hebei, Shanxi, Nei Monggol, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangxi, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Guangdong + Hainan, Sichuan + Chongqing,

List of provinces in the sample (1952–1977): the provinces of Jiangxi, Guangdong and Hainan, Sichuan and Chongqing and Ningxia have been excluded for the pre-reform period because of lack of data. The city of Tianjin is excluded for the pre-reform period in the risk-sharing analysis because of the non-availability of population data between 1952 and 1977.

The national account data (consumption, investment, saving, GDP) for OECD come from:

- United Nations Statistical Office, UN National Accounts .

The dataset includes 24 OECD countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

Variable definition

C_{it} : : Regional private (household) consumption.

S_{it}: : Regional savings defined as regional GDP minus private and government consumption.

I_{it}: : Regional investment defined as the change in gross capital formation both of the private and public sectors.

Some of the provinces constitute a non-trivial fraction of national output. We therefore use rest of the country instead of national aggregates in order to avoid distorting the sample correlations upwards using the following formula (where X_{it} stands for C_{-it}, I_{-it} or S_{-it} and Y_{it} is the provincial GDP).

$$X_{-i,t} = \sum_{j \neq i}^{n} X_{i,t} \Big/ \sum_{j \neq i}^{n} Y_{i,t}$$

C_{-it}: National consumption rate outside province I

S_{-it}: National saving rate outside province i,

I_{-it}: National investment rate outside province

F_{it}: Ratio of (regional) government consumption to local GDP.

y_{it}: Regional business cycle, generated by applying the Hodrick and Prescott (HP) filter to the local GDP series. We use HP(100) filtered log(province GDP) minus HP(100) filtered log(national GDP).

LRL_{it} (DRL^{it})= GDP_{it} - I_{it} – G_{it}: "Local" (Chinese provinces) or "Domestic" (OECD countries) Resource Limit.

$G_{it:}$ government consumption.

All variables are expressed in proportion of provincial GDP in section 2 (Investment-Saving analysis) and in per capita terms and using 1978 prices in section 2(Risk-Sharing analysis).

Provincial Capital Stocks

The series of provincial capital stocks is taken from Li (2003) that calculates capital stocks for each of the Chinese provinces between 1984 and 1998. The method consists of several steps listed below:

1. Estimating of capital depreciation rates between 1984 and 1992 (provincial fixed assets depreciation numbers are made available in official statistics starting in 1993). This is done by applying first a tentative depreciation rate of 4 percent over the period 1984–1992 in order to generate a temporary capital-stock series. The temporary capital stock series is used in turn to calculate an implied depreciation rate of capital between 1993 and 1998 (during which data on depreciation of fixed assets are made available). The average depreciation rate is in turn used to re-compute capital stock series between 1984 and 1992.

2. Calculating the initial value of capital stock. This is done by applying provincial capital ratios derived from equation X below to the national capital stock in 1984; ii) using equation (i).

$$(\Sigma_{(1985\text{-}88)}PRGI/\Sigma_{(1985\text{-}88)}PRGI) \quad \text{(i)}$$

$$K_t = K_{t-1} + RNI_t \quad \text{(ii)}$$

$$RNI_t = RGI_t - Dep_t \quad \text{(iii)}$$

3. Using the initial value of capital and the real gross investment figures (RGI), the depreciation figures (Dep_t) and equations (ii) and (iii), provincial capital stock are generated for the whole period up to 2001.

The series of capital productivity is in turn generated using equation (7). Because α is a time and province invariant parameter, we simply use the ratio of real GDP to real capital stocks (using 1978 prices) as a proxy for marginal product of capital.

Table 1. Flow of Financial Funds 2000
(In percent)

		Households		Non-financial corporations		Government		Financial institutions		Total	
		Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources	Uses	Sources
Net financial investment[1]/	**1**	**7,898**		**-5269,3**		**-1000**		**66,86**		**611,93**	
Financial uses	**2**	**100**		**100**		**100**		**100**		**100**	
Financial sources	**3**		**100**		**97**		**100**		**100**		**100**
Currency	**4**	**9**		**1**		**1**			**7**	**2**	**2**
Deposits	**7**	**61**		**78**		**76**		**3**	**95**	**35**	**36**
Loans	**14**		**100**		**59**		**7**	**80**	**-2**	**32**	**32**
Securities	**20**	**20**			**14**	**1**	**84**	**19**	**5**	**6**	**5**
bonds	**21**	**6**			**1**	**1**	**84**	**19**	**5**	**5**	**5**
share	**26**	**14**			**13**					**1**	**1**
Insurance technical reserves	27	11		1			8		6	0	0
Settlement funds	28	0		-37	3				-21	2	2
Interfinancial accounts	29							-2	-1	-1	0
Required&excessive reserves	30							3	4	8	10
Cash in vault	31							-2	-2	0	0
Central bank lending	32							-14	-16	8	8
Miscellaneous (net)	33	-2		44		23			28	-3	-6
Balance of payments											
Long-term capital	34			1	20					5	12
Short-term capital	35			12	10		1	8	-2	0	0
Changes in reserve assets	36							5		6	
Errors and Omissions in the Balance of Payments	37				-7						-3

Source: *The People 's Bank of China Quarterly Statistical Bulleti* 2002 Vol. 4 pp. 78–79.

1/ 100 millions of yuans.

Note: “uses” refers to the variation in assets; sources refers to the variation in liabilities.

Table 2. Summary of Literature on Investment-Saving Correlation Within Developed Countries

Country [time period]	Author	Saving coefficient[a]	Significance
Japan [1975–88][b]	Deckle (1996)	-0.30 (0.07)	significant (negative)
		-0.39 (0.09)	significant (negative)
		-0.23 (0.09)	significant (negative)
		-0.21 (0.06)	significant (negative)
Japan [1970–85]	Yamori (1995)	-0.26 (0.08)**	significant (negative)
		-0.36 (0.06)**	significant (negative)
		-0.29 (0.05)**	significant (negative)
Japan [1971–85]	Bayoumi and Rose (1993)	-0.48 (0.16)	significant (negative)
		0.24 (0.21)	non significant
		0.01 (0.14)	non significant
United States [1971–85]	Sinn (1992)	-0.11 (0.07) [c]	non significant
United Kingdom [1971–87]	Thomas (1993)	-0.56 (0.13)	significant (negative)
Canada [1961–89]		-0.10 (0.02)	significant (negative)
Germany [1970–87]		-0.06 (0.09)[d]	non significant

Standard errors in parentheses.
[a] Coefficient of the saving rate in the investment regression.
[b] Excluding Kanto and Kansai.

[c] Correlation.
[d] Private saving and investment.

Table 3: Unconditional FH Test: Chinese Provinces Versus OECD Countries

	(1)	(2)	(3)=(2)-(1)	(4)	(5)	(6)=(5)-(4)
China	1952–1977	1978–2001	diff.	1978–1989	1990–2001	diff.
(1) Investment-saving correlation*	0.534	0.525	-0.027	0.300	0.5991	0.2985
	(0.062)	(0.0910)	(0.092	(0.102)	(0.0841) **	(0.1200) ***
OECD	1960–1977	1978–1999	diff.	1978–1989	1990–1999	diff.
(2) Investment-saving correlation*	0.717	0.457	0.118	0.413	0.483	0.069
	(0.067)	(0.069)	(0.078) *	(0.099)	(0.094)	(0.138)

Source (China): A11 China Marketing Research, 2001, 1949–1999 China Statistical Data Compilation, China Statistical Bureau, Beijing. China Statistical Yearbook, various years, China Statistical Bureau, Beijing.

Source (OECD): UN National Accounts, World Development Indicators.

* average time correlation between investment and saving rates (percent GDP).
*(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
Standard errors in parentheses [a] average time correlation between investment and saving rates (percent GDP)
*(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
Standard errors in parentheses.
[i] reports the mean of the difference between pairwise correlations of the 2 sub-periods

Table 4a. Conditional FH Test

	(1)	(2)	(3)=(2)-(1)	(4)	(5)	(6)=(5)-(4)	(7)	(8)
	1952-1977	1978-2001	diff[i]	1978-1989	1990-2001	diff	Japan	OECD
(1) Raw Data	0.534	0.525	-0.009	0.300	0.599	0.299	0.31	0.56
	(0.062) **	(0.091) **	-0.092	(0.102) **	(0.0841) **	(0.120) ***	(0.04) ***	(0.04) ***
Controlling for								
(2) national factors	0.192	0.341	0.149	0.115	0.493	0.378	0.04	0.44
	(0.083) **	(0.092) **	(0.096)	(0.106)	(0.0835) **	(0.113) ***	(0.04	(0.07) ***
(3) national & regional factors								
& business cycle & fiscal policy	0.139	0.208	0.069	0.037	0.434	0.376	-0.01	0.28
	(0.070) **	(0.087) **	(0.087)	(0.102)	(0.0788) **	(0.116) ***	(0.04)	(0.05) ***
(4) Using one-year lagged regional variables								
& business cycle & fiscal policy	0.174	0.187	0.013	0.062	0.234	0.172		
(one year lagged)	(0.075) **	(0.094) **	(0.091)	(0.098)	(0.083) **	(0.069) ***		

Source: Columns 1–6, the authors' calculations; Columns 7 and 8, from Iwamoto and van Wincoop (2000).

*(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
Standard errors in parentheses

[i] reports the mean of the difference between pairwise correlations of the 2 sub-periods.

Table 4b. FH Test: Marginal Contribution of Saving to Investment)

		(1)		(2)		(3)		(4)=(3)-(2)	
		1978–2001		1978–1989		1990–2001		diff	
(1)	Raw data	0.300		0.202		0.567		0.365	
		(0.041)	**	(0.041)	**	(0.076)	**	(0.041)	***
(3)	Controlling for national & regional factors	0.310		0.169		0.513		0.344	
	business cycle & fiscal policy	(0.046)	**	(0.067)	**	(0.085)	**	(0.117)	***

Source: Authors' own calculations.

Note: This table reports the coefficient estimate "b" of the saving rate in the following investment regression: $i_{jt} = a + b.s_{jt} + u_{i.} + t_{j.} + e_{it}$ where "i" and "s" stand for the province investment and saving rates respectively, u and t are province and time fixed effects and e is the error term. Therefore, the saving coefficient represents the marginal contribution of local saving to local investment in the province.

Table 5. Conditional FH Test—Banking Data:
Chinese Provinces Versus OECD Countries

China	(1) 1978–1989	(2) 1990–2001	(3)=(2)-(1) diff[i]
(1) Raw data	0.664	0.505	-0.159
	(0.067) **	(0.078) **	(0.098) *
(2) Controlling for national factors	0.301	0.596	0.295
	(0.110) **	(0.091) **	(0.125) **
(3) national & regional factors	0.435	0.580	0.145
	(0.094) **	(0.095) **	(0.084) *
OECD countries	(1) 1978–1989	(2) 1990–2001	(3)=(2)-(1) diff[i]
(1) Raw Data	0.630	0.617	-0.013
	(0.087) **	(0.087) **	(0.147)
(2) Controlling for global factors	0.675	0.241	-0.434
	(0.081) **	(0.114) **	(0.095) **
(3) Global & national factors	0.675	0.285	-0.390
	(0.084) **	(0.116) **	(0.116) *

Source: Authors' own calculations.

*(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
Standard errors in parentheses.
[i] reports the mean of the difference between pairwise correlations of the 2 sub-periods.

Table 6. Unconditional Test of Risk Sharing—Consumption Correlations: Chinese Provinces Versus OECD Countries

	(1)	(2)	(3)=(2)-(1)	(4)	(5)	(6)=(5)-(4)
China	1952–1977	1978–2001	diff.	1978–1989	1990–2001	diff.
(1) Correlation of consumption*	0.621	0.541	-0.080***	0.698	0.213	-0.485***
	(0.028)	(0.031)	(0.028)	(0.030)	(0.063)	(0.069)
(2) Correlation of output*	0.800	0.652	-0.148***	0.633	0.723	0.090***
	(0.020)	(0.028)	(0.038)	(0.038)	(0.043)	(0.048)
(3) Ratio of consumption.	0.776	0.828	0.052	1.103	0.295	-0.808***
=(1)/(2) to output correlations	(0.042)	(0.047)	0.068	(0.111)	(0.102)	(0.160)
OECD	1960–1977	1978–1999	diff.	1978–1989	1990–1999	diff.
(4) Correlation of consumption*	0.352	0.352	0.000	0.411	0.355	-0.056
	(0.044)	(0.042)	(0.048)	(0.060)	(0.067)	(0.099)
(5) Correlation of output*	0.423	0.384	0.038	0.437	0.444	0.007
	(0.053)	(0.043)	(0.055)	(0.062)	(0.074)	(0.101)
(6) Ratio of consumption.	0.832	0.917	0.084	0.941	0.800	-0.141
to output correlations	(0.464)	(0.138)	(0.428)	(0.146)	(0.442)	(0.514)

Source (OECD) : UN National Accounts, World Development Indicators.
Source (China): A11 China Marketing Research, 2001, 1949–1999 China Statistical Data Compilation, China Statistical Bureau, Beijing.
China Statistical Yearbook, various years, China Statistical Bureau, Beijing.

*Correlation of per capita provincial (national) consumption and the rest of the country (of the world) per capita consumption.
Per capita consumption and GDP are expressed in real terms and by taking the first difference of the logarithm.
*(**, ***) significant at the 10 percent (5 percent, 1 percent) level (indicated only for the difference in mean tests in Columns 3 and 6.
Standard errors in parentheses.
[i] reports the mean of the difference between pairwise correlations of the 2 sub-periods.

Table 7. Summary of Studies on Consumption Smoothing Within Industrialized Countries

Country [# regions] Time period	Author	1 Correlation Consumption	2 Correlation Output	4 Volatility Consumption	3 Volatility Output
Japan [47] 1975–88	van Wincoop (1995)	0.46 (0.36)	0.42 (0.31)	1.97 (nr)	1.58 (nr)
Canada [10] 1971–91	Crucini (1995)	0.56 (0.17)	0.38 (0.31)	nr (nr)	nr (nr)
USA [51] 1971–91	Crucini (1995)	0.40 (0.22)	0.50 (0.21)	nr (nr)	nr (nr)
USA [19] 1977–91	Hess and Shin (1995)	0.31 (0.41)	0.67 (0.43)	3.35 (0.93)	3.2 (1.21)

Source: Hess and Shin (1997).

Notes: nr = not reported;
Standard errors in parentheses.

Table 8. Unconditional Test of Risk Sharing—Consumption Volatilities: Chinese Provinces Versus OECD Countries

China	(1) 1952–1977	(2) 1978–2001	(3)=(2)-(1) diff.	(4) 1978–1989	(5) 1990–2001	(6)=(5)-(4) diff.	
(1) Volatility of consumption	9.18	5.58	-3.60***	5.63	5.07	-0.56***	
	(1.09)	(0.202)	(1.11)	(0.22)	(0.323)	(0.39)	
(2) Volatility of output	14.15	4.23	-9.92***	4.57	3.66	-0.91***	
	(0.79)	(0.15)	(0.84)	(0.23)	(0.242)	(0.34)	
(3) Ratio of consumption.	0.649	1.319	0.670***	1.232	1.385	0.153	(3)
to output volatilities	(0.275)	(0.138)	(0.260)	(0.142)	(2.12)	(2.20)	=(1)/(2)
OECD	1960–1977	1978–1999	diff.	1978–1989	1990–1999	diff.	
(4) Volatility of consumption	2.61	2.15	-0.46*	2.25	1.84	-0.41**	
Std(Cit)	(0.365)	(0.183)	(0.252)	(0.233)	(0.171)	(0.212)	
(5) Volatility of output	2.71	1.98	-0.73***	1.96	1.86	-0.10	
Std(Yit)	(0.221)	(0.117)	(0.192)	(0.129)	(0.157)	(0.185)	
(6) Ratio of consumption.	0.963	1.086	0.123***	1.148	0.989	-0.159*	
to output volatilities	(0.069)	(0.065)	(0.049)	(0.085)	(1.168)	(0.089)	

Source (OECD) : UN National Accounts, World Development Indicators.
Source (China): A11 China Marketing Research, 2001, 1949–1999 China Statistical Data Compilation, China Statistical Bureau, Beijing.
China Statistical Yearbook, various years, China Statistical Bureau, Beijing.
In bold: non significantly different from one.

Volatility: time-series standard deviation of per capita consumption (GDP) for each province (country).
Per capita consumption and GDP are expressed in real terms and by taking the first difference of the logarithm.
*(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
Standard errors in parentheses.

Table 9. Conditional Test of Risk Sharing—Incomplete Asset Market: Chinese Provinces
(Dependent Variable: Logarithm of Per Capita Household Real Consumption (Variation))

Period	1952–1977	1978–2001	1978–1989	1990–2001
dln(C-it) - (b)	0.722 ***	0.867 ***	0.878 ***	0.672 **
	(0.070)	(0.051)	(0.051)	(0.219)
dln(LRLt) - (c)	0.277 ***	0.033 ***	0.056 ***	0.140 **
	(0.055)	(0.0186)	(0.012)	(0.019)
adj. r2	0.92	0.29	0.49	0.12
# obs	597	665	330	335
# provinces	23	28	28	28
H1: b=1	F(1,562)=15.62 ***	F(1,635)=6.48 ***	F(1,300)=5.72 **	F(1,305)=2.23
H2: c=1	F(1,562)=171.4 ***	F(1,635)=2605 ***	F(1,300)=6429 ***	F(1,305)=2663 ***
H3: b=1 & c=0	F(2,562)=12.72 ***	F(2,635)=3.86 **	F(2,300)=13.64 ***	F(2,305)=1.50
H4: b=0 & c=1	F(2,562)=86.22 ***	F(2,635)=1310 ***	F(2,300)=3306 ***	F(2,305)=1331 ***

Source: Authors' own calculations.

C-it: national per capita household real consumption outside the province i , Yit: per capita household real GDP , LRLit= Yit - Iit - Git (Local Resource Limit), Iit: provincial per capita real investment, Git: provincial per capita government real consumption, ln: logarithm, d: first difference *(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
All the regressions include fixed provincial effects.
Robust standard errors in parentheses.
H1: null hypothesis of the consumption (C-it) coefficient b not being different from one (high degree of risk-sharing).
H2: null hypothesis of the local resource limit (LRLit) coefficient b not being different from one (low degree of risk-sharing)
H3: null hypothesis of the joint significance of the consumption coefficient (C-it) not being different from one and the local resource limit (LRLit) coefficient not being different from zero (high degree of risk-sharing).
H4: null hypothesis of the joint significance of the consumption coefficient (C-it) not being different from zero and the local resource limit (LRLit) coefficient not being different from one (low degree of risk-sharing).

Table 10. Conditional Test of Risk Sharing—Incomplete Asset Market: OECD Countries
(Dependent Variable: Logarithm of Per Capita Household Real Consumption (Variation))

Period	1960–1977	1978–1999	1978–1989	1990–1999
dln(C-it) - (b)	0.354 ***	0.629 ***	0.600 ***	0.897 ***
	(0.101)	(0.097)	(0.113)	(0.252)
dln(DRLit) - (c)	0.425 ***	0.203 ***	0.239 ***	0.081
	(0.079)	(0.072)	(0.089)	(0.108)
adj. r2	0.34	0.18	0.31	0.21
# obs	381	528	288	240
# countries	24	24	24	24
H1: b=1	F(1,355)=40.68 ***	F(1502)=14.78 ***	F(1,262)=12.74 ***	F(1,214)=0.17
H2: c=1	F(1,355)=52.45 ***	F(1,502)=122.51 ***	F(1,262)=73.82 ***	F(1,214)=71.53 ***
H3: b=1 & c=0	F(2,355)=31.95 ***	F(2,502)=9.59 ***	F(2,262)=7.99 ***	F(2,214)=0.37
H4: b=0 & c=1	F(2,355)=30.39 ***	F(2,502)=70.86 ***	F(2,262)=41.69 ***	F(2,214)= 42.42 ***

Source: Authors' own calculations.

C-it: national per capita household real consumption outside the province i.
Yit: per capita household real GDP.
LRLit= Yit - Iit - Git (Local Resource Limit).
Iit: provincial per capita real investment.
Git: provincial per capita government real consumption.
ln: logarithm, d: first difference *(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
all the regressions include fixed country effects.
Robust standard errors in parentheses.
H1: null hypothesis of the consumption (C-it) coefficient b not being different from one (high degree of risk-sharing).
H2: null hypothesis of the local resource limit (LRLit) coefficient b not being different from one (low degree of risk-sharing).
H3: null hypothesis of the joint significance of the consumption coefficient (C-it) not being different from one and the local resource limit (LRLit) coefficient not being different from zero (high degree of risk-sharing).
H4: null hypothesis of the joint significance of the consumption coefficient (C-it) not being different from zero and the local resource limit (LRLit) coefficient not being different from one (low degree of risk-sharing).

Table 11. Variation in Capital Mobility in the 1990s

Panel A	(1) 1990–1995	(2) 1996–2001	(3)=(2)-(1) diff.
(1) Investment-saving correlation (unconditional)	0.6109	0.5846	0.0262
	(0.1002)	(0.0807)	(0.1190)
(2) Investment-saving correlation (conditional)	0.3614	0.4245	0.0631
	(0.1101)	(0.0981)	(0.1385)
(3) Deposit-Loans correlation (unconditional)	0.439	0.569	0.13
	(0.098)	(0.082)	(0.118)
(4) Deposit-Loans correlation (conditional)	0.492	0.58	0.088
	(0.089)	(0.100)	(0.096)
(5) Risk-Sharing-Consumption to output correlations (unconditional)	-0.027	0.289	0.541 ***
	(0.122)	(0.182)	(0.031)
(6) Risk-Sharing-Consumption to output volatilities (unconditional)	1.73	2.11	0.38
	(0.273)	(0.216)	(0.290)

Panel B	1990-1995	1996-2001
Risk-Sharing (Conditional)		
dln(C-it)	0.334	0.808 ***
	(0.368)	(0.249)
dln(LRLt)	0.172 ***	0.007
	(0.044)	(0.103)
adj. r2	0.28	0.20
# obs	168	167
# provinces	28	28
H3: b=1 & d=0	F(2,138)=8.17 ***	F(2,137)=0.55
H4: b=0 & d=1	F(2,138)=175.9 ***	F(2,137)=4906 ***

Source: Authors' own calculations.

C-it: national per capita household real consumption outside the province i.
Yit: per capita household real GDP.
DRLit= Yit - Iit - Git (Domestic Resource Limit).
Iit: provincial per capita real investment.
Git: provincial per capita government real consumption.
ln: logarythm, d: first difference.
*(**, ***) significant at the 10 percent (5 percent, 1 percent) level.
all the regressions include fixed provincial effects.
Robust standard errors in parentheses.

Table 12. Capital Flows and Capital Productivity

		Investment by source of funds				
	net capital inflows	State budget	Bank loans	Fdi	Fundraising	Other
Initial GDP per capita	-0.03 *	-0.0065 **	-0.024 ***	-0.001	0.030 **	0.012
	0.01	0.003	0.05	0.003	0.011	0.008
Marginal product of capital	-0.28 *	-0.15 ***	-0.15 ***	0.05	0.16 **	0.004
	0.15	0.04	0.05	0.09	0.07	0.042
Sargan test	3.15	12.48	0.52	10.63	3.082	4.157
AR(2) test	-0.87	-2.90 **	-1.494	-1.179	-2.220	1.611
# provinces	25	22	20	22	20	20
#obs	100	85	77	85	77	74

Source: Authors' own calculations.

GMM system estimator. All regressions use robust standard errors reported below.
All dependent variables are expressed as a ratio of provincial GDP. Net capital inflows are calculated by subtracting net investment from net savings in the province. State budget appropriation refers to appropriation in the budget of the central and local governments earmarked for capital construction and innovation projects, and the special appropriation from the budget of the central government for capital construction and for the transfer fund to banks to be issued as loans for earmarked projects. Domestic loans refers to various funds borrowed by enterprises and institutions from banks and non-bank financial institutions during the reference period for the purpose of investment in fixed assets, including loans issued by banks from their self-owned funds and deposits, loans appropriated by higher responsible authorities, special loans by government, loans arranged by local governments for special funds, and working loans, etc. Foreign investment refers to foreign funds received during the reference period for the purpose of investment in fixed assets, including foreign funds borrowed and managed by the government, by individual units, foreign fund in joint venture program and issue of bonds and stocks at the international financial markets. Self-raised funds refer to funds received by enterprises from their higher responsible authorities, local government or raised by enterprises or institutions themselves for the purpose of investment in fixed assets during the reference period. Others refer to fund received during the reference period which are not included in the above mentioned sources. Initial GDP par capita is the initial GDP per capita in 1978 prices (logarithm).
The assumption of no serial correlation is essential for the consistency of estimators which instrument the lagged dependent variable with further lags of the same variable. If the disturbances are not serially correlated, there should be evidence of significant negative first order serial correlation in the differenced residuals and not evidence of second-order serial correlation in the differenced residuals. The Sargan (1964) test of overidentifying restrictions is also reported. This performs a joint test of the model specification and the validity of instruments (i.e. tests if the set of moment conditions are respected).

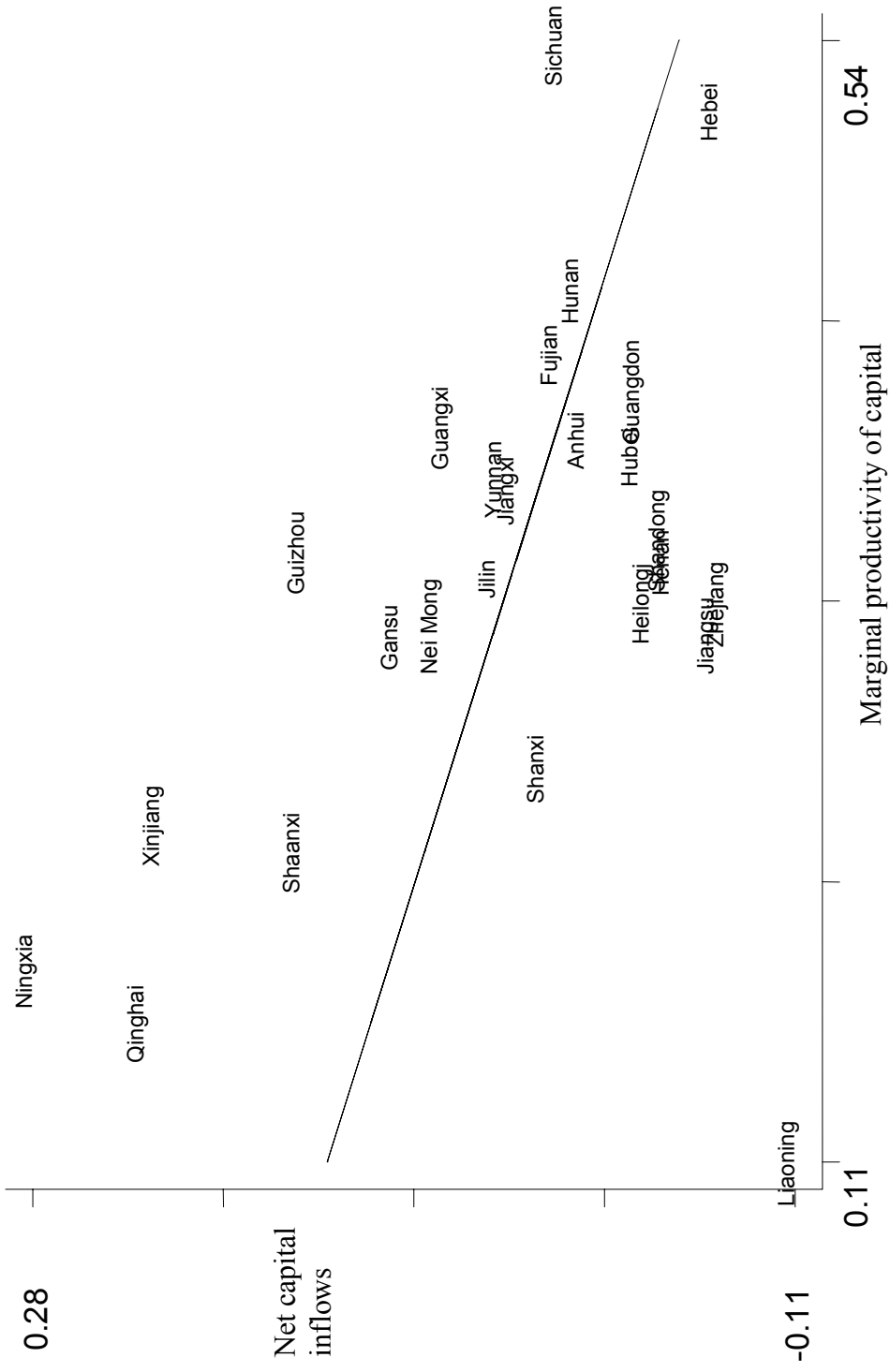
Table 13: Policy-Oriented Versus Market-Oriented Capital Allocation:
Importance of State Sector and Primary Production

	Investment by source of funds											
	net capital flows		state budget		bank loans		FDI		Fundraising		Other	
Initial GDP per capita	-0.06	**	-0.01		0.01	***	0.00967		0.022	***	-0.010	
	0.02		0.01		0.018		0.00834		0.021		0.020	
Share of state-production	0.13	*	0.07	***	0.05	*	-0.0251	***	0.015		0.012	
in industrial production	0.07		0.01		0.029		0.00836		0.028		0.033	
Share of primary production	-0.56	**	-0.17		-0.195		0.073		-0.087		-0.082	
in GDP	0.28		0.11		0.187		0.077		0.244		0.205	
Sargan test	23.44		20.10		16.74		17.31		16.56		18.51	
AR(2) test	-0.547		-1.601		-1.561		-0.7473		-1.72		0.7073	
Number of provinces	25		22		20		22		20		20	
Number of observations	150		85		77		85		77		74	

Source: Authors' own calculations.

GMM system estimator.

Figure 1: Net Capital Inflows and Capital Productivity
(average values over 1984–2001)



Source: Authors' own calculations.

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